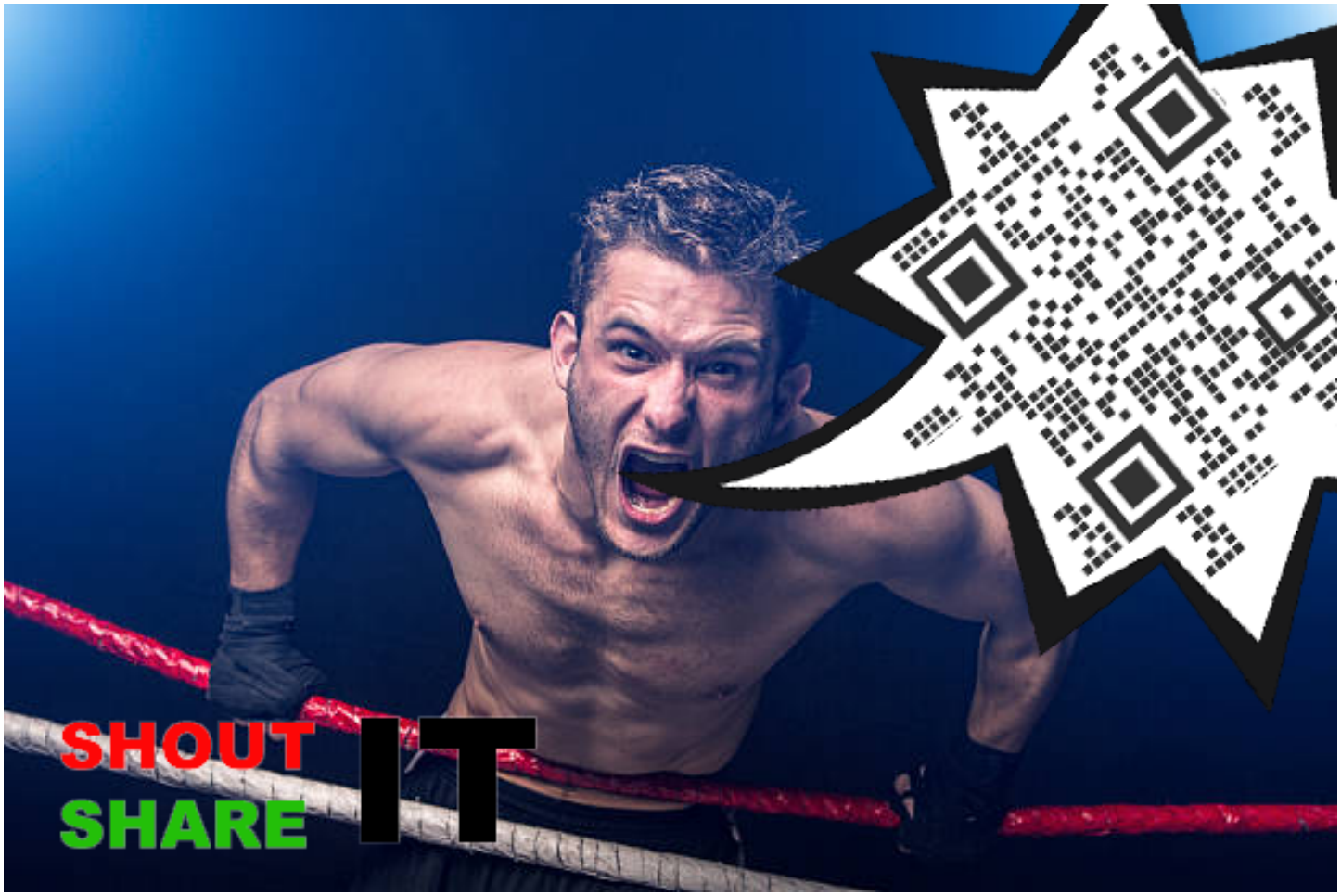
SHOUT
SHARE
IT

Bulletins 152-168 OK - RBS. 4/10/42

163 = 23d/24th Ann. Rpt 1905/1906 ? OK - RBS 4/16/42

Experiment Station Library.

Class ~~630.73~~

Number ~~A53 Cop. 3~~

Volume ~~Bulletins 152-168~~

Source

Received June 1915 (Neal)

Cost

Accession No. 3417 Ex. S.

UNH LIBRARY
3 4600 00618 4532

Bulletin 152 January, 1911

NEW HAMPSHIRE
AGRICULTURAL EXPERIMENT STATION
DEPARTMENT OF ANIMAL HUSBANDRY

The Shepherd's Harvest

FEEDING SHEEP AND LAMBS: CLOVER HAY v. NATIVE HAY; TURNIPS v. DRY RATION

T. R. ARKELL.

NEW HAMPSHIRE COLLEGE
OF
AGRICULTURE AND THE MECHANIC ARTS
DURHAM, N. H.

S
29
.E21
NO. 152-
NO. 168

NEW HAMPSHIRE COLLEGE OF AGRICULTURE
AND THE MECHANIC ARTS.

NEW HAMPSHIRE AGRICULTURAL EXPERIMENT STATION

DURHAM, N. H.

Board of Control

HON. JOHN G. TALLANT, *Chairman,*	West Concord
HON. WARREN BROWN,	Hampton Falls
HON. N. J. BACHELDER, A. M., M. S.,	East Andover
HON. E. H. WASON, B. S.,	Nashua
PRES. WILLIAM D. GIBBS, D. Sc., *ex officio,*	Durham

The Station Staff

JOHN C. KENDALL, B. S., *Director.*
FREDERICK W. TAYLOR, B. Sc. (Agr.), *Agronomist.*
CHARLES BROOKS, Ph. D., *Botanist.*
FRED RASMUSSEN, B. S. A., *Dairyman.*
B. S. PICKETT, M. S., *Horticulturist.*
B. E. CURRY, A. B., *Chemist.*
T. R. ARKELL, B. S. A., *Animal Husbandman.*
W. C. O'KANE, M. S., *Entomologist.*
CHARLES W. STONE, A. M., *Farmer, and Vice-director.*
W. H. WOLFF, M. S., *Assistant Horticulturist.*
DAVID LUMSDEN, *Assistant in Floriculture.*
W. L. SLATE, Jr., B. S. (Agr.), *Assistant in Agronomy.*
T. O. SMITH, A. B., *Assistant Chemist.*
J. J. GARDNER, B. S., *Assistant in Olericulture.*
O. L. ECKMAN, B. S., *Assistant Animal Husbandman.*
CAROLINE A. BLACK, A. M., *Assistant Botanist.*
MIRIAM L. HOBBS, *Purchasing Agent.*
MABEL H. MEHAFFEY, *Stenographer.*
M. GENEVIEVE BURT, *Bookkeeper.*
MARY L. BURNHAM, *Stenographer.*

The bulletins of the Experiment Station are published at irregular intervals, and are sent *free* to all residents of New Hampshire requesting them.

FEEDING SHEEP AND LAMBS: CLOVER HAY v. NATIVE HAY; TURNIPS v. DRY RATION.

T. R. ARKELL.

General Summary.

1. Clover hay, as a feed for sheep, is decidedly more profitable and more economical in mutton production than native hay.

2. The native hay contained large quantities of timothy and other grasses that the sheep did not relish. Timothy hay is not a palatable feed for sheep.

3. The relative difference in price between timothy or native hay and clover hay is such that the sheep raiser in New Hampshire, who is not growing clover, can profitably sell the former and purchase the latter, or better still, alfalfa, for his sheep.

4. So long as the market price of hay continues high in New Hampshire with the comparatively low price of grain, when the greater feeding value of the latter is considered, the sheep feeder can well afford to feed grain in the winter ration.

5. Turnips, in the winter ration, reduce the cost of mutton production.

6. Turnips, owing to their watery nature, render the ration more palatable, and are distinctly useful, when fed in moderate quantities in conjunction with hay and grain, in preventing constipation and other resultant ills, which so frequently occur when sheep are changed from pasture to dry feed.

7. The chief danger with turnips lies in heavily overfeeding or attempting to make them constitute the bulk of the ration, when they are liable to make the ration too laxative and produce scouring.

8. Turnips are well adapted to New Hampshire soils and climate.

9. They can be raised and stored at a cost low enough to compete with silage and in many cases supplant silage for sheep feeding.

10. Turnips or other roots offer a partial solution to the problem of securing a substitute for high priced grain.

INTRODUCTION.

Sheep raising in New Hampshire is fast becoming an important phase of the livestock industry. Its development, or rather redevelopment, within recent years has been rapid, and every year shows a consistent and satisfactory increase in numbers. Farmers are beginning to realize how profitable, when pursued upon a systematic basis, sheep raising is. Attention is being paid, not only to general sheep raising, but to that more intensive form of it—winter or "hot-house" lamb production. Early lamb raising yields large returns owing to the proximity and easy access to the Boston and New York markets, where the highest prices in America prevail for this product.

There are many advantages of sheep raising that should appeal to the average farmer and make him a convert to the business. First, the initial investment need not be great. In fact, a beginner should always start with but a few sheep. As his flock grows, so will his experience in methods of management, and he will not be so liable to make costly mistakes. Nor has the sheep breeder long to wait before he realizes a return from his investment. If he practises winter or "hot-house" lamb raising, he sells his lambs at from ten to fourteen weeks of age, and, even though he is simply raising lambs for the late summer or fall trade, he will seldom have to keep them longer than eight months. By selling his ram lambs and keeping his ewe lambs, he is obtaining considerable profit and at the same time increasing his flock rapidly without a further monetary expenditure.

Sheep can be maintained very cheaply and still thrive and return a profit. Besides, their feeds need never be of an expensive nature. In the summer pasture alone is sufficient; in the winter good clover hay, oats and a few roots or other succulent food. Silage may be used in the place of roots, but very sparingly, as silage, if sour or moldy and if fed in quantities much over two pounds per day, is apt to cause severe digestive ailments, scouring and consequent loss in weight. Always make the sheep eat up cleanly what is placed before them, rather slightly underfeed than overfeed. This is the great secret of economical feeding, and, without the practice of strict economy in this respect, even reasonable profits can never be attained.

In restoring fertility to wornout pastures, sheep can be used effectively as one of the first aids. Their manure is rich and, besides, is evenly distributed over the entire field. Again, sheep are weed destroyers. Where there are many sheep but few weeds will thrive. They will eat and apparently enjoy almost every class of weeds, even one of such a prickly nature as the thistle. Sheep are the true pasture scavengers and at the same time natural fertilizers, and these two features are by no means unimportant in the New England scheme of farming.

Expensive buildings are not necessary in order to gain success with sheep raising. A barn wherein the sheep can be sheltered from the wintry winds and snow and be fed conveniently, is all that is needed. Sheep confined in a warm, poorly ventilated barn, as is the condition with so many cattle stables, will never thrive well and are very liable to disease and parasites. A warm lambing pen must, however, be provided, yet, after the first few weeks of their lives, even the lambs are capable of standing considerable cold with little or no ill-effects. This feature comprehends another most important advantage of sheep raising, and permits the man with a small capital to enter and pursue the business successfully.

OBJECT.

It is the purpose of this bulletin to present, in as clear and concise fashion as possible, the results of feeding tests, that were pursued during 1909–10, to discover the relative feeding values for sheep of,—

1. Clover hay *versus* the ordinary hay mixture, designated native hay, that is grown all too prevalently in New Hampshire
2. Turnips in conjunction with grain and hay *versus* dry ration of grain and hay only.

FEEDING AND MANAGEMENT.

Feeding was carefully prosecuted in every instance. Regularity was a factor to which strict attention was paid. The sheep were fed twice a day, in the morning at 7 and at 4.30 in the afternoon. The rations were always weighed out accurately at every meal. They had access to water and salt, the latter being supplied in the rock form, at all times of the day. An abundance of bedding was provided and, to minimize the possibility of an outbreak of disease, the buildings were kept well disinfected. Large yards were connected with the barn, so that the sheep were able to take plenty of exercise. During the experiment the sheep were all healthy and vigorous.

Both feeding tests were of ninety-eight days' duration. Careful weighings of the individual sheep were made every two weeks, and accurate records of the rate of gain kept. Variations in the time of weighing and the normal condition of the sheep at that time were strictly avoided. Before commencing the experiments the sheep were given a preliminary feeding of two weeks to accustom them to the feeds forming their rations.

CLOVER HAY VERSUS NATIVE HAY.

Outline of Experiment.

Four lots of sheep were used, five in each lot. Two lots comprised ewe lambs; the others, two to three-year-old ewes. The lambs all belonged to some mutton breed, namely, Hampshire, Southdown, Dorset Horn and Shropshire, there being an equal number of specimens of the different breeds in both lots. The aged ewes were Rambouillets and Natives, the latter representing the ordinary grade stock in New Hampshire. None of them were with lamb.

Both lots of lambs were fed an equal quantity of grain of a similar character (corn, bran and oats in equal parts by weight) and of turnips. In addition one lot was given clover hay; the other, an equal quantity of native hay. With the aged ewes the same plan was followed except that the hay composed the bulk of the ration, turnips only being fed besides.

Lot I.—Fed Clover Hay

COMPOSITION OF NATIVE HAY.

The name, native hay, is somewhat misleading. It was used for lack of a better title to distinguish it readily from the clover hay. The native hay of New Hampshire is usually nothing more nor less than wornout timothy hay or pasture, where the natural grasses have taken almost entire possession of the land. It may, however, also constitute hay harvested from meadows where cultivated grasses have never been sown. The physical composition is by no means uniform. It varies considerably according to its timothy content or the length of time that has elapsed since it was first seeded.

Timothy in itself is not suitable as a feed for sheep, and oftentimes in native hay the presence of large quantities of timothy gives to it its low feeding value. One of the main objections to timothy for sheep is its lack of palatability. Sheep do not care for it and, if placed upon a large timothy ration, will not eat sufficiently of it to make substantial gains. In fact, frequently under such conditions, the gains are negative.

The sample of native hay obtained for the feeding test was fairly typical of what prevails throughout the state. A physical analysis was made, and the following grasses distinguished:

TABLE 1.—MIXTURE OF GRASSES COMPOSING NATIVE HAY.

Common Name.	Scientific Name.	Percentage of Composition.
Timothy or Herd's grass	Phleum pratense	40
Red Top	Agrostis alba	20
Kentucky Bluegrass	Poa pratensis	15
Meadow Foxtail	Alopecurus pratensis	8
Alsike	Trifolium hybridum	5
Oat Grass	Danthonia spicata	5
Red Clover	Trifolium pratense	4
Quack or Couch Grass	Agrogyron repens	3

The chemical composition is as follows:

TABLE 2.—PERCENTAGE COMPOSITION OF NATIVE HAY.

Water.	Ash.	Protein.	Crude Fiber.	N. Free Extract.	Fat.
10.80	6.49	5.70	28.90	45.45	2.66

A fairly accurate, though not elaborate, digestion experiment was performed with one of the sheep to determine the relative digestibility of the native hay used in the feeding test.*

The digestion coefficients are given in Table 3.

TABLE 3.—DIGESTION COEFFICIENTS OF NATIVE HAY.

Protein (Per cent.).	Crude fiber (Per cent.).	N. Free Extract (Per cent.).	Fat (Per cent.).
42	53	58	49

WEIGHTS AND GAINS OF SHEEP.

Lots I and II contained the lambs; III and IV the aged ewes. Lots I and III were supplied clover hay; II and IV, native hay. The sheep in the different lots were selected, so as to be as nearly alike as possible and thus obviate striking individual differences. In lot IV, sheep No. 18 made negative gains, yet she appeared perfectly healthy and vigorous and apparently ate her feed as well as the others.

* Acknowledgment is due to Mr. W. L. Adams, formerly assistant in chemistry at New Hampshire Experiment Station, for successful prosecution of this phase of the experiment; also to bulletins No. 114 and No. 71 of the South Dakota and Nevada Agricultural Experiment Stations, respectively, from which valuable information was gleaned as to methods of pursuing this work.

TABLE 4.—BI-WEEKLY WEIGHTS OF LAMBS.

Lot.	No.	Breed.	Dec. 6.	Dec. 20.	Jan. 3.	Jan. 17.	Jan. 31.	Feb. 14.	Feb. 28.	Mar. 14.
I	117	Hampshire	93½	98½	104	109	114	118	123	128
	124	Hampshire	109	114	119	124½	130	135	139½	144½
	155	Southdown	95	99	103	108	114	119½	125	130
	136	Dorset	123½	129	134	139	143½	147½	152	157
	138	Shropshire	90	93	97½	102½	108	113	118	124
II	169	Hampshire	98	103	107	112	117	121	125	129
	120	Hampshire	108½	113	117	121	124	127½	130	133
	158	Southdown	101	105	108	112	115	117	120	124
	160	Dorset	104	106	109	112	115½	118	120	122
	127	Shropshire	89	90	92	94	97	99	102	105
III	90	Native	126	128	131	133	134	137	139½	143
	70	Native	123	127	132	136	139	142½	146	149
	14	Rambouillet	104	105	107½	109½	112½	115	117	118½
	13	Rambouillet	103	106	108	111	114½	117½	120	123
	64	Rambouillet	114½	116	118	119	120½	123	125	127½
IV	43	Native	129	130	131	133	133	134	136	137
	65	Native	127	129	132	134	135	137	139	140
	63	Rambouillet	125	126	126	126½	127½	128	128	129
	18	Rambouillet	104	104	104	103	101	101	102	102
	15	Rambouillet	104	105	106	108	108	108½	109	109

Lot II.—Fed Native Hay

TABLE 5.—SUMMARY OF GAINS.

Lot I.				Lot II.			
No.	Breed.	Total Individual gain (lbs).	Daily Individual gain (lbs).	No.	Breed.	Total Individual gain (lbs).	Daily Individual gain (lbs).
117	Hampshire	34.5	.352	169	Hampshire	31.0	.316
124	Hampshire	35.5	.362	120	Hampshire	24.5	.250
155	Southdown	35.0	.357	158	Southdown	23.0	.234
136	Dorset	33.5	.341	160	Dorset	18.0	.183
138	Shropshire	34.0	.346	127	Shropshire	16.0	.163

Lot III.				Lot IV.			
No.	Breed.	Total Individual gain (lbs).	Daily Individual gain (lbs).	No.	Breed.	Total Individual gain (lbs).	Daily Individual gain (lbs).
90	Native	17.0	.173	43	Native	8	.081
70	Native	26.0	.265	65	Native	13	.132
14	Rambouillet	14.5	.147	63	Rambouillet	4	.040
13	Rambouillet	20.0	.204	18	Rambouillet	−2	−.020
64	Rambouillet	13.0	.132	15	Rambouillet	5	.051

	Lot 1.	Lot 2.
Total gain, pounds	172.500	112.500
Average net gain per lamb, pounds	34.500	22.500
Average daily gain per lamb, pounds	.351	.229
	Lot 3.	Lot 4.
Total gain, pounds	90.500	32.000
Average net gain per lamb, pounds	18.100	6.400
Average daily gain per lamb, pounds	.184	.065

Both lots I and III, according to Table 5, show considerable advantage over lots II and IV, respectively, in average gain per lamb. The greater gains of lots I and II over the others is to be expected: lambs will always gain at a greater rate than aged sheep. The disparity in rates of gain is distinctly apparent between lots III and IV, the former making an average increase per sheep almost three times greater than the latter. In fact, in lot IV the daily gain per sheep was exceedingly small. This points so far strongly to the advantage of clover hay over native hay as a feed for sheep.

Lot III.—Fed Clover Hay

Lot IV.—Fed Native Hay

CHARACTER AND AMOUNTS OF FEED.

Corn, bran and oats, in equal parts by weight made up the grain mixture. Its average composition is represented in Table 6.

TABLE 6.—AVERAGE COMPOSITION OF ONE POUND OF GRAIN MIXTURE.

Water (lbs).	Ash (lbs).	Protein (lbs).	Crude Fiber (lbs).	N. Free Extract (lbs).	Fat (lbs).
.112	.034	.125	.069	.613	.047

The character of the rations is clearly indicated in Table 7.

TABLE 7.—COMPOSITION OF RATIONS.

Lot.	Ration.	Pounds per day per sheep.	Water (lbs.).	Ash (lbs.).	Protein (lbs.).	Crude fibre (lbs.).	N. free extract.	Fat (lbs.).
I	Grain	½	.056	.017	.063	.035	.306	.023
	Turnips	2	1.772	.024	.024	.026	.150	.004
	Clover	1½	.230	.093	.185	.372	.571	.049
	Total	4	2.058	.134	.272	.433	1.027	.076
II	Grain	½	.056	.017	.063	.035	.306	.023
	Turnips	2	1.772	.024	.024	.026	.150	.004
	Native Hay	1½	.162	.097	.085	.433	.681	.039
	Total	4	1.990	.138	.172	.494	1.137	.066
III	Turnips	4	3.544	.048	.048	.052	.300	.008
	Clover Hay	2	.306	.124	.246	.496	.762	.066
	Total	6	3.850	.172	.294	.548	1.062	.074
IV	Turnips	4	3.544	.048	.048	.052	.300	.008
	Native Hay	2	.216	.129	.114	.578	.909	.053
	Total	6	3.760	.177	.162	.630	1.209	.061

The amounts of the rations supplied respectively to lots I and II and to lots III and IV were equal. These were regulated by discovering the maximum feeding capacity of the lots fed on native hay. The others were then given an equal quantity. The sheep showed a marked partiality for the clover hay, which they ate greedily, while they by no means relished the native hay. However, to the aged ewes no grain whatever was given. The object of this was to determine whether sheep could be

carried through the winter upon clover and native hay, when fed practically alone, and make at the same time substantial and profitable gains. It is true that with the clover hay fairly good increases in weight were obtained, yet that these gains were as economically made as though grain were fed in connection with the ration, is to be doubted. Since this experiment provides no direct evidence wherefrom comparisons in this respect may be drawn, as the lambs, which were fed grain, naturally would make greater gains anyway than the aged sheep, yet the relative cost of grain and hay in New Hampshire affords sufficient data for fairly accurate deductions. The cost of all classes of hay, except clover, in this state in 1909 was approximately a cent a pound ($20 per ton) and of grain, such as is used for sheep, on an average about a cent and a half a pound. The relative difference in price is exceedingly small, when account is taken of the greater increases in weight it is recognized grain will produce.

Therefore, in New Hampshire, from the standpoint of economy, unless the prevailing prices of feeds completely change, the plan of attempting to winter sheep on hay alone, especially with lambs and pregnant ewes, should never be practised.

Turnips were fed in conjunction with all the rations to provide succulence and to give to the feed a laxative tone.

TABLE 8.—DIGESTIBLE NUTRIENTS AND NUTRITIVE RATIOS OF RATIONS.*

Lot.	Ration.	Pounds per sheep per day.	Dry matter (lbs.).	Digestible Protein (lbs.).	Digestible crude fiber (lbs.).	Digestible N. free extract (lbs.).	Digestible fat (lbs.).	Nutritive ratio.
I	Grain	½	.444	.048	.008	.247	.018	
	Turnips	2	.228	.020	.019	.143	.004	
	Clover hay	1½	1.270	.102	.211	.326	.025	
	Total	4	1.942	.170	.238	.716	.047	6.2
II	Grain	½	.444	.048	.008	.247	.018	
	Turnips	2	.228	.020	.019	.143	.004	
	Native Hay	1½	1.338	.035	.184	.395	.019	
	Total	4	2.010	.103	.211	.785	.041	10.5
III	Turnips	4	.456	.040	.038	.286	.008	
	Clover Hay	2	1.694	.136	.282	.434	.034	
	Total	6	2.150	.176	.320	.720	.042	6.4
IV	Turnips	4	.456	.040	.038	.286	.008	
	Native Hay	2	1.784	.047	.246	.527	.026	
	Total	6	2.240	.087	.284	.813	.034	13.5

* Digestible coefficients were obtained from Henry's "Feeds and Feeding."

The nutritive ratios, shown in Table 8, clearly indicate the difference between clover and native hay in the amounts of digestible nutrients they contain The native hay is exceedingly low in digestible protein, and comparatively high in digesti-

ble carbohydrates, consequently producing a wide nutritive ratio—wider by far than that for clover hay Nor are the digestion coefficients for the native hay so high as for the clover.

COST OF RATIONS AND GAINS.

TABLE 9.—POUNDS OF DIGESTIBLE NUTRIENTS FOR 100 POUNDS INCREASE IN WEIGHT.

Lot.	Ration.	Dry Matter.	Digestible Protein.	Digestible Carbohydrates.	Digestible Fat.
I	Grain, Turnips, Clover Hay.....	553.27	48.43	271.76	13.39
II	Grain, Turnips, Native Hay.....	961.72	44.97	434.93	17.90
III	Turnips, Clover Hay.....	1,168.47	95.65	565.21	22.82
IV	Turnips, Native Hay.....	3,446.15	133.84	1,687.69	52.30

TABLE 10.—AVERAGE WEIGHT AND COST OF FEED FOR 100 POUNDS INCREASE IN WEIGHT.

Lot.	Grain (lbs.).	Turnips (lbs.).	Native Hay (lbs.).	Clover Hay (lbs.).	Total Cost.
I	142	569		427	$7.66
II	218	873	655		12.40
III		2,173		1,086	16.24
IV		6,152	3,076		42.87

Tables 9 and 10 are self-explanatory. In these the supremacy of clover hay over native hay as a feed for sheep is patently shown. Both the clover hay fed lots required less feed to produce a hundred pounds increase in weight, and the cost of producing this gain was much less. In fact, with lot IV the cost was exorbitant and far from profitable.

Another feature is emphasized in Table 10, and that is the greater cost of producing an increase in weight with aged sheep than with lambs. That this criterion also applies, although not to such an extent, in comparing lambs with yearlings, should be borne in mind by the practical feeder. If merely preparing his sheep for the shambles, he should sell as lambs, and thus avoid the added expense of a prolonged feeding period and the naturally increased cost of producing a pound of gain.

TABLE 11.—COMPARISON AS TO COST OF RATIONS.

Lot.	Cost for 98 Days.	Daily Cost.
I	$2.63	$.026
II	2.78	.028
III	2.74	.028
IV	2.94	.030

The feed used in the experiment was all purchased, and the prevailing market prices charged in calculating the cost of rations. This by no means gives unfair comparisons in regard to conditions on the average farm, since the farmers of New Hampshire have to buy the bulk of their grain and can readily sell their hay at the regnant market price. Bran cost $27 a ton, corn $28 a ton, oats an average of 54 cents a bushel. The clover hay was delivered from Ohio at $18 per ton, but the native hay, even with close buying, cost $20 a ton and the turnips $5 per ton. Consequently, in all results where cost is concerned, the clover hay has had an added advantage over the native hay, since the initial purchasing expense was not so great. However, this is but slight, and in no way disturbs or unduly influences the real results.

CONCLUSION.

The foregoing results should afford ample proof of the superiority of clover hay over the native hay as a feed for sheep. It is more palatable, as shown by the fact, as already stated, that the sheep would not eat the native hay so readily. The clover hay contains greater amounts of digestible nutrients, especially protein, and produced larger and more economical gains. In fine, the best plan for a farmer to pursue without clover and with sheep to winter, is to sell his timothy and native hay and purchase for his sheep clover or better yet, if he can obtain it at a reasonable price, alfalfa, as alfalfa has a still higher feeding value than clover. He should not, however, overlook the relatively small difference in price that really exists between hay and grain, when comparative feeding values are taken into consideration, and, therefore, should feed some grain in conjunction with the hay. Again, roots are necessary to give a laxative tone to the ration. The amounts will vary with different conditions; the feeder must determine these for himself. He should make it a point to feed so as to keep well within the pale of profit and at the same time produce as large gains as possible.

Lot I.—Fed Dry Rations

TURNIPS VERSUS DRY RATION.

Outline of Experiment.

Ten ewe lambs were selected and divided into two lots, containing two Shropshires, two Dorsets and one Hampshire in each lot. One lot (lot I) was fed grain and clover hay; the other (lot II), grain, clover hay and turnips. The amount of grain and clover hay given to lot II was reduced to correspond in cost of ration to that of lot I. In amounts of digestible nutrients there was little difference between the two rations. However, the ration of lot I (without turnips) possessed a slight advantage in this respect.

Each lamb in lot I was given per day a ration consisting of 1 pound of grain (oats, bran and corn in equal parts by weight) and 2 pounds of clover hay; lot II, ¾ of a pound of the same grain mixture, 1 ¼ pounds of clover hay and 5 pounds of turnips. The daily cost of each ration amounted to 3 ½ cents a day, and the cost for the entire feeding period of 98 days, approximately $3.50.

WEIGHTS AND GAINS OF LAMBS.

The lambs of both lots possessed at the beginning of the experiment fairly uniform weights. They had previously been fed together on the same rations. Fortnightly records of their weights had been kept, and it was impossible to distinguish any material difference in their rates of increase. Consequently, the feeding trial may be considered a fair test of the value of turnips in a winter ration.

TABLE 12.—BI-WEEKLY WEIGHTS OF LAMBS.

Lot.	No.	Breed.	Dec. 6.	Dec. 20.	Jan. 3.	Jan. 17.	Jan. 31.	Feb. 14.	Feb. 28.	Mar. 14.
I.	116	Shropshire....	100	104½	109	113	116½	120	123	126
	125	Shropshire....	111½	117	122	127	132½	137½	142	146½
	112	Dorset.....	96	101	105½	110	114	118	121½	124
	118	Dorset.....	112½	117½	122	127	131	135	138	142
	109	Hampshire....	107	111	115	119	122	125	128	131
II.	126	Shropshire....	111	116	122	127½	132	138	143½	149
	130	Shropshire....	96	102	108	113	118½	124	130	136
	111	Dorset.....	110	115	120	124	129½	135	140	145½
	132	Dorset.....	98	102	107	112½	117½	122	126	131
	106	Hampshire ..	113	118	124	130	135	141	146	152

TABLE 13.—SUMMARY OF GAINS.

Lot I.				Lot II.			
No.	Breed.	Total Individual gain (lbs.).	Daily Individual gain (lbs.).	No.	Breed.	Total Individual gain (lbs.).	Daily Individual gain (lbs.).
116	Shropshire....	26.0	.265	126	Shropshire.....	38.0	.387
125	Shropshire....	35.0	.357	130	Shropshire.....	40.0	.408
112	Dorset.....	28.0	.285	111	Dorset.....	35.5	.362
118	Dorset.....	29.5	.301	132	Dorset.....	33.0	336
109	Hampshire ..	24.0	.244	106	Hampshire.....	39 0	.397

	Lot 1.	Lot 2.
Total gain, pounds	142.500	185.500
Average net gain per lamb, pounds	28.500	37.100
Average daily gain per lamb, pounds	.290	.378

In every instance the turnip fed lambs (lot II) made decidedly better gains than those upon the dry ration. The results are striking. Toward the end of the experiment, as represented in Table 12, the difference in the gains of the two lots is especially apparent, the lambs in lot II excelling the others to a marked degree. This was due, perhaps, largely to a stagnation of the appetite of those fed on the dry ration. It was with the greatest difficulty that they were made to eat up all of their ration. In fact, with one sheep in lot I epsom salts had to be used to correct costiveness. Those given turnips, however, eagerly sought and would have eaten more. Had their full appetite been appeased, they doubtless would have made even larger gains and with as great economy.

Lot II.—Fed Turnips

CHARACTER AND AMOUNTS OF FEED.

The grain mixture was similar to the one used in Experiment I. (For composition see Table 6.)

TABLE 14.—COMPOSITION OF RATIONS.

Lot.	Ration.	Pounds per day per sheep.	Water (lbs.).	Ash (lbs.).	Protein (lbs.).	Crude fiber (lbs.).	N. free extract (lbs.).	Fat (lbs.).
I.	Grain	1	.112	.034	.125	.069	.613	.046
	Clover Hay	2	.306	.124	.246	.496	.762	.066
	Total	3	.418	.158	.371	.565	1.375	.112
II.	Grain	¾	.084	.025	.093	.051	.459	.034
	Clover Hay	1¼	.192	.077	.153	.310	.476	.041
	Turnips	5	4.430	.060	.060	.065	.375	.010
	Total	7	4.706	.162	.306	.426	1.310	.085

A noteworthy feature in Table 14 is the watery nature of the turnips. This factor comprehends their real feeding value. They give to the ration a laxative effect, and, consequently, keep the sheep in a healthy, vigorous condition. Their high digestibility should also be remarked in Table 15.

TABLE 15.—DIGESTIBLE NUTRIENTS AND NUTRITIVE RATIOS OF RATIONS.*

Lot.	Ration.	Pounds per sheep per day.	Dry matter (lbs.).	Digestible Protein (lbs.).	Digestible crude fiber (lbs.).	Digestible N. free extract (lbs.).	Digestible fat (lbs.).	Nutritive ratio.
I.	Grain	1	.888	.097	.017	.493	.037	
	Clover Hay	2	1.694	.136	.282	.434	.034	
	Total	3	2.582	.233	.299	.927	.071	5.9
II.	Grain	¾	.666	.072	.012	.369	.027	
	Clover Hay	1¼	1.058	.085	.176	.271	.021	
	Turnips	5	.570	.050	.045	.360	.010	
	Total	7	2.294	.207	.233	1.000	.058	6.6

* Digestible coefficients were obtained from Henry's "Feeds and Feeding."

COST OF RATIONS AND GAINS.

As heretofore stated, the daily cost of the rations were equal, namely, 3½ cents per day. The cost was computed upon the same price basis as described in Experiment I.

The turnip fed lambs, as shown in Tables 16 and 17, made considerably better gains at the expense of less feed and incidentally less cost than the lambs on the dry ration. This proves that turnips decrease the cost of producing a pound of mutton.

TABLE 16.—POUNDS OF DIGESTIBLE NUTRIENTS FOR 100 POUNDS INCREASE IN WEIGHT.

Lot.	Ration.	Dry Matter.	Digestible Protein.	Digestible Carbohydrates.	Digestible Fat.
I.	Grain, Clover Hay	889.11	80.34	422.75	24.48
II.	Grain, Clover Hay, Turnips	606.87	54.76	326.19	15.34

TABLE 17.—AVERAGE WEIGHT AND COST OF FEED FOR 100 POUNDS INCREASE IN WEIGHT.

Lot.	Grain (lbs.).	Turnips (lbs.).	Clover Hay (lbs.).	Total Cost.
I.	344		688	$11.96
II.	198	1322	330	9.60

It can be conclusively stated, from the results of this experiment, that turnips have a beneficial effect in economy of mutton production. There is, however, one danger with turnips and

that lies in overfeeding or attempting to make them constitute the bulk of the ration. Turnips, on account of their watery nature, are not in themselves a substantial food. When extravagantly fed, they are apt to render the ration too laxative and produce scouring. Besides, to pregnant ewes heavy overfeeding of turnips will not infrequently cause them to bring forth lambs that are flabby or weakly. Four pounds per day to a sheep, however, is a safe limit.

Mangels and sugar beets, although rather more palatable and sheep prefer them slightly to turnips, are for rams expressly unsuited, as they are conducive to the deposition of calculi in the kidneys, bladder and urethral tract.* These calculi are composed chiefly of calcium phosphate, are irritative to the urinary organs and will frequently attain sufficient size to close completely the urethral tract, causing in consequence the certain death of the ram. Turnips apparently have no such ill effect.

To recapitulate, turnips reduce the cost of mutton production, aid in the digestion of the fibrous foods and keep the sheep in a healthy and vigorous physical condition. They are a boon in the ration inasmuch as they prevent constipation and many other resultant ills, which so frequently occur when sheep are changed from pasture to dry feed. It must, however, always be borne in mind that turnips should be supplied only as a supplementary feed to give to the winter ration the slightly laxative effect of pasture.

* Bulletin 112, Iowa Agricultural Experiment Station.—Influence of feeding sugar beets and mangels to breeding animals with special reference to the formation of renal and urinary calculi.

630.72
N532
no.152-168

DATE DUE

A fine of Two Cents will be charged for each day the book is kept overtime.

FEB 1 1 '59			
DEC 7 '60			
DEC 1 '98			

F32